Ref. 1

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-146379
(43)Date of publication of application : 22.05.2002

(51)Int.Cl. C10M169/04
C10M129/32
C10M129/40
C10M129/54
C10M129/58
C10M135/10
// C10N 10:02
C10N 10:04
C10N 10:06
C10N 10:08
C10N 10:10
C10N 10:12
C10N 10:14
C10N 10:16
C10N 20:00
C10N 30:04
C10N 40:25

(21)Application number : 2000-344972
(22)Date of filing : 13.11.2000

(71)Applicant : TONENGENERAL SEKIYU KK
PETROLEUM ENERGY CENTER
(72)Inventor : ONODERA YASUSHI
IWASAKI HIROYUKI

(54) LUBRICANT OIL COMPOSITION FOR DIESEL ENGINE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a lubricant oil composition for a diesel engine that can reduce the exhaustion of the suspended particulate matter and shows excellent lubricant oil consumption properties.
SOLUTION: In this invention, the base oil comprising mineral oil and/or synthetic oil is combined with an oil-soluble organic acid metal salt in an amount of 0.001-3.0 wt.% based on the total of the lubricant composition thereby providing the objective lubricant oil composition for a diesel engine.

CLAIMS

[Claim(s)]
[Claim 1]To base oil which consists of mineral oil and/or synthetic oil, as a combustion improver, on a constituent whole-quantity standard. Are 0.001 to 3.0% of the weight of oil-soluble organic acid metal salt a lubricating oil composition for diesel power plants to blend, and this organic acid metal salt, Organic acid, a scandium and titanium, vanadium, chromium, manganese, Iron, cobalt, nickel, copper, zinc, strontium, yttrium, a zirconium, niobium, a ruthenium, rhodium, palladium, silver, cadmium, indium, barium, or a lubricating oil composition for diesel power plants that is at least one sort of organic acid metal salt with a lanthanoids.
[Claim 2]The lubricating oil composition for diesel power plants according to claim 1 in which base oil is characterized by a NOACK amount of evaporation being 18 or less % of the weight.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the lubricating oil composition for diesel power plants where the suspended particulate matter in exhaust gas is reduced and which is excellent in the lubricous oil consumption characteristic in more detail about the lubricating oil composition for diesel power plants.
[0002]
[Description of the Prior Art]The air pollution by nitrogen oxides (NOx), a suspended particulate matter (PM may be called hereafter), etc. which are discharged from burners, such as a diesel power plant, poses a problem. PM consists of a meltable organic substance (SOF may be called hereafter) which is unburned combustibles of sulfate resulting from the sulfur content in fuel, soot, and fuel and the lubricating oil in which the bottom of an oil entered the combustion chamber by ** etc. Among these, the rate of SOF is said to be 30 to 40% among all the PM. In order to reduce PM, it is necessary to reduce SOF.
In the engine maker, in order to reduce PM, combustion improvements by a series of engine modification, such as improvement of various fuel injection systems and an improvement of a combustion chamber, are continued. Such a combustion improvement measure serves as a rise in heat of a piston, the oxidation degradation of a lubricating oil is promoted, and it is said that the piston deposit of a top land is increased. Therefore, there is a demand of severe improved efficiency to a lubricating oil for the suspended particulate matter reduction in emission gas. For example, it is cutting down lubricating oil consumption, raising heat resistance and a detergency, etc. From PM, only with the combustion improvement measure of the engine, correspondence is becoming difficult, it is a measure of the lubricating oil [itself] itself, and making it decrease further is demanded.
[0003]By the way, the measure against reduction of PM to the lubricating oil proposed from the former mainly reduced lubricating oil consumption, and only controlled generation of SOF. As other art, to two kinds of specific base oil, hypoviscosity base oil and hyperviscous base oil, for example. The lubricating oil composition for diesel power plants (JP,10-53788,A) etc. which blended specific ethylene and alpha olefin copolymer, and reduced PM, and were excellent in fuel-efficiency are only proposed a little.
[0004]However, there was a limit in reduction of such lubricating oil consumption, there was a limit also in reduction of the lubricating oil in which a lubricating oil enters a combustion chamber, and there was a limit in reduction of PM generated by this. In order to control lubricating oil consumption, 18 or less % of the weight of NOACK amounts of evaporation need to use 15 or less % of the weight of heavy base oil, or the nature base oil of inside preferably, but since heavy base oil is inferior to flammability, the consumed lubricating oil also has the problem of generating SOF without burning.
[0005]
[Problem(s) to be Solved by the Invention]The purpose of this invention is to provide the lubricating oil composition for diesel power plants which can reduce the suspended particulate matter discharged and is excellent in the lubricous oil consumption characteristic by the

operation effect of the lubricating oil itself in view of the above-mentioned actual condition.
[0006]
[Means for Solving the Problem]By burning thoroughly a lubricating oil included in an engine combustion chamber in an engine combustion chamber, as a result of inquiring wholeheartedly, in order for this invention persons to conquer a problem of said conventional technology and to reduce a suspended particulate matter in exhaust gas, Lubricating oil consumption can be controlled based on technical thought of reducing PM. And when a lubricating oil composition which burns easily in an engine combustion chamber, i.e., a lubricating oil composition which carried out specific amount content of the combustion improver specific to a lubricating oil, is prepared, can burn most organic nature ingredients in a consumed lubricating oil, and as a result, It found out PM and that a part for SOF in PM could be reduced especially substantially. This invention comes to be completed based on these knowledge.
[0007]Namely, according to this invention, as a combustion improver to base oil which consists of mineral oil and/or synthetic oil on a constituent whole-quantity standard. Are 0.001 to 3.0% of the weight of oil-soluble organic acid metal salt a lubricating oil composition for diesel power plants to blend, and this organic acid metal salt, Organic acid, a scandium and titanium, vanadium, chromium, manganese, Iron, cobalt, nickel, copper, zinc, strontium, yttrium, A lubricating oil composition for diesel power plants which is a zirconium, niobium, a ruthenium, rhodium, palladium, silver, cadmium, indium, barium, or at least one sort of organic acid metal salt with a lanthanoids is provided. As for base oil, according to this invention, the above-mentioned lubricating oil composition for diesel power plants, wherein a NOACK amount of evaporation is 18 or less % of the weight is provided.
[0008]This invention relates to a lubricating oil composition for diesel power plants containing at least one sort of combustion improvers of oil-soluble organic acid metal salt, etc., as described above, but the following are included as the desirable mode.
(1) The above-mentioned lubricating oil composition for diesel power plants, wherein a diesel power plant is operated with fuel whose sulfur content is 100 ppm or less.
(2) A lubricating oil composition for diesel power plants given in above either to which a diesel power plant is characterized by being equipped with a particulate filter.
(3) A lubricating oil composition for diesel power plants given in above either, wherein organic acid is at least one sort of 2-ethylhexanoic acid, octanoic acid, octenate, stearic acid, oleic acid, naphthenic acid, petroleum sulfonic acid, sulfonic acid, or salicylic acid.
(4) A lubricating oil composition for diesel power plants given in above either, wherein organic acid metal salt is 2-ethylhexanoic acid iron salt, 2-ethylhexanoic acid nickel salt, or 2-ethylhexanoic acid indium.
(5) A lubricating oil composition for diesel power plants given in above either which carries out adding an antioxidant to base oil with the feature further.
(6) A lubricating oil composition for diesel power plants given in above either, wherein a diesel power plant is operated with fuel whose sulfur content is 50 ppm or less.
(7) How to decrease a suspended particulate matter in diesel-power-plant exhaust gas adding the above-mentioned oil-soluble organic acid metal salt in a lubricating oil, and burning lubricous oil in a combustion chamber.
(8) How to decrease a suspended particulate matter in the above-mentioned diesel-power-plant exhaust gas, wherein a lubricating oil contains base oil of 18 or less % of the weight of NOACK amounts of evaporation as the main ingredients.
(9) How to decrease a suspended particulate matter in the above-mentioned diesel-power-plant exhaust gas further characterized by adding an antioxidant in a lubricating oil.
[0009]
[Embodiment of the Invention]Hereafter, this invention is explained in detail.
1. The base oil used for the lubricating oil composition for diesel power plants of lubricant-base-oil this invention, In order to obtain the lubricous oil consumption characteristic which was excellent in order to control lubricating oil consumption, As an evaporation characteristic, 18 or less % of the weight, a NOACK amount of evaporation needs to be 15 or less % of the weight preferably, and is limited for neither in particular the other performance, nor description, a kind,

etc., and anything can be used if generally used as lubricant base oil. That is, mineral oil, synthetic oil, or those mixed oils to correspond to these exist.

[0010]As mineral oil, the charge of lubricous Yuhara derived by the ordinary pressure or distillation under reduced pressure of a crude oil Phenol, Furfural, the solvent refining raffinate produced by processing with the aromatic extraction solvent like N-methyl pyrrolidone, The hydrogen treatment oil produced by contacting the charge of lubricous Yuhara in hydrogen under hydrogen treatment conditions under existence of the catalyst for hydrogen treatment, The lubricating oil fraction etc. which are obtained combining the isomerized oil produced by contacting a wax in hydrogen under an opposite-sex Shimojo affair under existence of the catalyst for isomerization or solvent refining processes, a hydrogen treatment process, an isomerization process, etc. can be mentioned. Also in which manufacturing method, processes, such as a winterization process, a hydrofinishing process, and a clay-treatment process, are arbitrarily employable with a conventional method. Base oil can be adjusted by mentioning light neutral oil, the nature neutral oil of inside, heavy neutral oil, bright stock, etc., and mixing suitably as an example of mineral oil, so that demand description may be fulfilled.

[0011]As synthetic oil, for example Poly alpha olefin, alpha-olefin oligomer, Polybutene, alkylbenzene, a polyol ester, a dibasic acid ester, vegetable oil and fat, polyoxy alkylene glycol, polyoxyalkylene glucohol ether, silicone oil, etc. can be mentioned.

[0012]Such base oil is independent, respectively, or can be used combining two or more sorts, and may be used combining mineral oil and synthetic oil. The base oil used by this invention usually has the kinetic viscosity of 2-20-mm^2/s in 100 **, and suitable kinetic viscosity is the range of 3-15-mm^2/s. If agitating resistance will become large, and the coefficient of friction in a fluid lubrication region will become high, if the kinetic viscosity of lubricant base oil is too high, fuel-efficiency gets worse and kinetic viscosity is too low conversely, The difficulty that an evaporation characteristic worsens, lubricating oil consumption increases in sliding parts, such as a valve gear system of a diesel power plant, a piston, a ring, and a bearing, or wear increases, and as a result PM increases arises.

[0013]2. In the lubricating oil composition for diesel power plants of combustion-improver this invention, oil-soluble organic acid metal salt is used as a combustion improver of an essential ingredient.

[0014]If the above-mentioned organic acid metal salt used by this invention functions as a combustion improver or a combustion improving agent, it will not be what is limited especially, For example, it is metal salt of organic acid, such as 2-ethylhexanoic acid, octanoic acid, octenate, stearic acid, oleic acid, naphthenic acid, petroleum sulfonic acid, sulfonic acid, and salicylic acid, and metal salt of desirable organic acid is metal salt of 2-ethylhexanoic acid. Such oil-soluble organic acid metal salt promotes combustion of the lubricating oil included in a combustion chamber by a catalysis, for example.

[0015]As metal of the oil-soluble organic acid metal salt used by this invention, Scandium (Sc), titanium (Ti), and vanadium (V), chromium (Cr), Manganese (Mn), iron (Fe), cobalt (Co), nickel (nickel), Copper (Cu), zinc (Zn), strontium (Sr), yttrium (Y), Lanthanoidses, such as a zirconium (Zr), niobium (Nb), a ruthenium (Ru), rhodium (Rh), palladium (Pd), silver (Ag), cadmium (Cd), indium (In), barium (Ba), and a lantern (La), cerium (Ce), are mentioned. Also in these metal, they are iron, nickel, and indium preferably.

[0016]As oil-soluble organic acid metal salt, the salt of the above-mentioned organic acid and metal is mentioned, and using these independently can also use together two or more sorts of organic acid metal salt. Also in such oil-soluble organic acid metal salt, they are 2-ethylhexanoic acid iron salt, and 2-ethylhexanoic acid nickel salt or 2-ethylhexanoic acid indium salt preferably.

[0017]It was known that these organic acid metal salt has a combustion promotion operation to various fuel oil. However, in order that such a combustion improver might promote the oxidation degradation of a lubricating oil, using it as an additive agent of a lubricating oil was not considered, and were not actually used until now, but. When this invention persons blended the specific combustion improver with diesel engine oil, the above-mentioned thing of the adverse

effect to oxidation degradation was small, and the inflammable improvement in the lubricating oil included in a combustion chamber found out the large thing, i.e., the yield of PM resulting from a lubricating oil can be decreased. It was expected that a combustion improved effect would also attain to the lubricating oil in which the combustion improver added by fuel oil entered the combustion chamber, and this invention persons are also checking that there is no inflammable improved effect to a lubricating oil.

[0018]although this invention persons are not clear about the mechanism of action — an outline — it is guessed that it is as follows. In combustion of a diesel power plant, since air is not beforehand mixed with fuel, combustion does not necessarily take place uniformly by the combustion chamber, and usually takes place on the outskirts of the fuel sprayed on the combustion chamber existing. On the other hand, a lubricating oil disperses from between a piston/cylinder etc., and it is said that it mainly goes into a combustion chamber in the state of an oil droplet. In a combustion chamber, if it does not mix, but a lubricating oil and fuel exist unevenly and show the state, they will become like drawing 2. When burning if the temperature near [the] an oil droplet goes up by a combustion chamber and combustion temperature is reached by combustion of fuel in it, and not reaching, the oil droplet of a lubricating oil is discharged as unburnt oil, and serves as an ingredient of PM.

[0019]When a combustion improver is added to fuel, the fuel itself burns easily and combustion near fuel is promoted. However, since there is no direct influence about combustion of the lubricating oil which has dispersed in the state of an oil droplet, the combustion facilitatory effect is small, or it can be said that there is almost nothing. On the other hand, when a combustion improver is added to a lubricating oil, the lubricating oil itself burns easily. That is, the lubricating oil which has dispersed in the state of an oil droplet reaches combustion temperature at a lower temperature, and the lubricating oil itself can burn easily. Therefore, only when a combustion improver is added to a lubricating oil, the yield of PM which the inflammable improved effect of the lubricating oil which entered the combustion chamber is acquired, and originates in a lubricating oil as a result can be decreased. On the other hand, in the combustion improver added by fuel oil, the inflammable improved effect to the lubricating oil which entered the combustion chamber is not acquired, and the yield of PM resulting from a lubricating oil cannot be decreased.

[0020]In the lubricating oil composition for diesel power plants of this invention, the content of oil-soluble organic acid metal salt is a constituent whole-quantity standard, and is 0.003 to 1.0 % of the weight preferably 0.001 to 3.0% of the weight. The inflammable improvement in a lubricating oil is no longer obtained as content is less than 0.001 % of the weight. On the other hand, if it exceeds 3.0 % of the weight, the inflammable improvement in the lubricating oil according to an addition rate is not obtained, and it is not desirable.

[0021]3. Although at least one sort of combustion improvers of the above-mentioned oil-soluble organic acid metal salt are contained as an essential ingredient at lubricant base oil in the lubricating oil composition for diesel power plants of other additive component this inventions, In order to secure the performance which the various performances are demanded of the lubricating oil for diesel power plants, and was adapted for them, Furthermore, various additive agents, i.e., non-ash powder medicine, a metal cleaner, a viscosity index improver, pour point depressant, a reducing friction agent, an abrasion proof agent, an extreme pressure agent, an antioxidant, a metal deactivator, a rust-proofer, a defoaming agent, corrosion inhibitor, colorant, etc. can be suitably added in the range which does not spoil the purpose of this invention if needed.

[0022]As non-ash powder medicine, although a succinimid system, a succinic acid amide system, a benzylamine system, a succinate system, succinic acid ester amide systems, those boron inclusions, etc. are mentioned, boron content succinimid is especially used preferably from heat resistance or a wear-resistant point. These are constituent whole-quantity standards and are usually used at 0.1 to 15% of the weight of a rate.

[0023]As a metal cleaner, although sulfonate systems, such as Ca, Mg, Ba, and Na, a phenate system, a salicylate system, a phosphonate system, etc. are mentioned, these are constituent whole-quantity standards and are usually used at 0.05 to 5% of the weight of a rate.

[0024]as a viscosity index improver — general — a polymethacrylate system and an olefin copolymer system (a polyisobutylene system.) An ethylene propylene rubber system, a poly alkyl styrene system, a styrene butadiene hydrogenation copolymer system, a styrene maleic-anhydride-ester copolymer system, a star-like isoprene system, etc. mention, and **** is a constituent whole-quantity standard and, as for these, is usually used at 0.01 to 30% of the weight of a rate.

[0025]As pour point depressant, generally the condensate of an ethylene-vinylacetate copolymer, a chlorinated paraffin, and naphthalene, the condensate of a chlorinated paraffin and phenol, polymethacrylate, poly alkyl styrene, etc. are mentioned, and polymethacrylate is used preferably especially. These are constituent whole-quantity standards and are usually used at 0.01 to 5% of the weight of a rate.

[0026]Generally as a reducing friction agent, an organic molybdenum compound, fatty acid, higher alcohol, fatty acid ester, fatty acid part ester, oil and fat, amine, amide, ester sulfide, phosphoric ester, phosphite, phosphoric ester amine salt, etc. are mentioned. These are constituent whole-quantity standards and are usually used at 0.05 to 3% of the weight of a rate.

[0027]Generally as an abrasion proof agent, they are dithiophosphate zinc and dithiophosphate metal salt (). [Pb and] dithiocarbamic acid metal salt (Zn —), such as Sb and Mo, [Pb, Sb and] Naphthenic soap (Pb etc.), such as Mo, fatty acid metal salt (Pb etc.), a boron compound, phosphoric ester, phosphite, phosphoric ester amine salt, etc. are mentioned, and these are constituent whole-quantity standards and are usually used at 0.1 to 5% of the weight of a rate. Especially, dialkyl phosphorodithioate zinc is used preferably and 0.04 to 0.16 % of the weight is preferred as phosphorus concentration as loadings in this case.

[0028]ash-free [generally] as an extreme pressure agent — a system sulfide compound, sulfurized oil fat, phosphoric ester, phosphite, phosphoric ester amine salt, etc. are mentioned, and these are constituent whole-quantity standards and are usually used at 0.05 to 3% of the weight of a rate.

[0029]Generally as an antioxidant, alkylation diphenylamine, phenyl-alpha-naphthylamine, Aromatic amine system antioxidants, such as alkylated phenyl alpha-naphthylamine and phenothiazin, 2,6-ditertiary-butylphenol, 4,4'-methylenebis (2,6-ditertiary-butylphenol), the Lynn system antioxidants, such as sulfur-systems antioxidants, such as phenolic antioxidants, such as isooctyl-3-(3,5-di-t-butyl-4-hydroxyphenyl) propionate, and dilauryl 3,3'-thiodipropionate, and phosphite, -- dithiophosphate zinc etc. are mentioned further. These are constituent whole-quantity standards and are usually used at 0.05 to 5.0% of the weight of a rate.

[0030]As a metal deactivator, benzotriazol, a triazole derivative, benzotriazole derivatives, a thiadiazole derivative, etc. are mentioned, and these are constituent whole-quantity standards and are usually used at 0.001 to 3% of the weight of a rate.

[0031]As a rust-proofer, for example Fatty acid, alkenyl succinic acid half ester, Fatty acid soap, an alkyl-sulfonic-acid salt, polyhydric alcohol fatty acid ester, fatty acid amine, oxidation paraffin, alkyl polyoxyethylene ether, etc. are mentioned, and these are constituent whole-quantity standards and are usually used at 0.01 to 3% of the weight of a rate.

[0032]As a defoaming agent, dimethylpolysiloxane, polyacrylate, etc. are mentioned and it is usually added about 0.002% of the weight very in small quantities, for example. Other additive agents, such as corrosion inhibitor and colorant, can also be used for the lubricating oil composition of this invention according to a request.

[0033]Although the lubricating oil composition for diesel power plants of this invention has the above-mentioned contents and the feature, As described above, a suspended particulate matter (PM), Since it consists of SOF which is unburned combustibles of sulfate resulting from the sulfur content in fuel, soot, and fuel and the lubricating oil in which the bottom of an oil entered the combustion chamber by ** etc., in order to reduce PM, the lubricating oil composition of this invention is used, and it is also effective to reduce sulfate resulting from the sulfur content in fuel. Therefore, in the diesel power plant for which the lubricating oil composition of this invention is used, it is desirable for 100 ppm or less of sulfur content of fuel to be 50 ppm or less preferably from 500 ppm or less of about actual condition, for example, 420-450 ppm, from the point of reducing PM.

[0034]In order to reduce PM, it is also very effective to reduce soot, i.e., a particulate, further in addition to the above. Therefore, it is desirable to carry out the trap of the particulate discharged by being equipped with a particulate filter to the diesel power plant for which the lubricating oil composition of this invention is used from the point of reducing PM. Although it is ultralow volume, since being discharged by the atmosphere is also considered after the added metal salt burns, also in order to prevent it, being equipped with a particulate filter is desirable.
[0035]
[Example]Next, although an example and a comparative example are given and this invention is explained still in detail, this invention in particular is not limited to these examples. Evaluation of the lubricous oil consumption characteristic, lubricating oil flammability, and an evaporation characteristic (NOACK amount of evaporation) was performed by the method shown below about the example and the comparative example.
[0036](1) the lubricous oil consumption characteristic -- lubricating oil consumption was measured according to the following sample offering engine and the test condition, using an oil-consumption meter (product 403S made by AVL) as evaluation of the lubricous oil consumption characteristic.
Sample-offering engine: Accessory cell type diesel power plant (3.0L, with a supercharger)
Test condition: Number of rotations of 3600 rpm, 1/4 and 110 ** of load oil-temperatures parameter:lubricating-oil-consumption g/h [0037](2) By the lubricating oil flammability differential-thermal-analysis method, according to the following test condition, it asked for the exothermic peak at the time of temperature up, was considered as pyrolysis temperature, and was considered as the evaluation index of lubricating oil flammability. Lubricating oil flammability is excellent, and as shown in drawing 1, a SOF discharge decreases as a result, so that pyrolysis temperature is low.
Test condition: A part for /, the amount of 80%helium+20%O_2 atmosphere and heating-rate samples of 10 ** of 2 mg [0038](3) evaporation characteristic (NOACK amount of evaporation) The NOACK amount of evaporation performed by evaluation of an evaporation characteristic measuring and computing a NOACK amount of evaporation is based on CEC L-40-T-87, and is an evaporation loss measured and computed on the conditions of -20mmH_2O for 250 ** and 1 hour.
[0039][Examples 1-3] As lubricant base oil, two kinds of solvent refining paraffin series mineral oil is used for Examples 1-3, and to this, they are constituent whole-quantity standards and as a combustion improver in Example 1. The lubricating oil composition which blended 2-ethylhexanoic acid nickel in Example 2 0.087% of the weight, and blended 2-ethylhexanoic acid indium for 2-ethylhexanoic acid iron 0.047% of the weight in Example 3 0.058% of the weight was prepared, and the lubricous oil consumption characteristic, lubricating oil flammability, etc. were evaluated. A presentation, description, and an evaluation result are shown in Table 1.
[0040][Examples 4 and 5] Blend the lubricant-base-oil ingredient shown in Table 1, and a viscosity index improver ingredient at a rate shown in the table, and to this on a constituent whole-quantity standard. As a combustion improver, the lubricating oil composition which blended 2-ethylhexanoic acid iron 0.087% of the weight was prepared like Example 1, and the lubricous oil consumption characteristic, lubricating oil flammability, etc. were evaluated. A presentation, description, and an evaluation result are shown in Table 1.
[0041][Comparative example 1] The same lubricant-base-oil ingredient as Examples 1-4 shown in Table 1 was blended at a rate shown in the table, and a combustion improver was not contained, but the lubricating oil composition was prepared. The lubricous oil consumption characteristic, lubricating oil flammability, etc. were evaluated like Examples 1-5. A presentation, description, and an evaluation result are shown in Table 1.
[0042][Comparative example 2] The lubricant-base-oil (light base oil) ingredient shown in Table 1 and the viscosity index improver ingredient were blended at a rate shown in the table, and a combustion improver was not contained, but the lubricating oil composition was prepared. The lubricous oil consumption characteristic, lubricating oil flammability, etc. were evaluated like Examples 1-5 and the comparative example 1. A presentation, description, and an evaluation

result are shown in Table 1.

[0043]

[Table 1]

			実施例1	実施例2	実施例3	実施例4	実施例5	比較例1	比較例2
組成(重量%)	基油	軽質基油	0	0	0	0	4.6	0	90.6
		中質基油	45	45	45	71.3	87.5	45	0
		重質基油	54.91	54.94	54.95	23.8	0	55	0
	燃焼促進剤	2-エチルヘキサン酸鉄	0.087	0	0	0.087	0.087	0	0
		2-エチルヘキサン酸ニッケル	0	0.058	0	0	0	0	0
		2-エチルヘキサン酸インジウム	0	0	0.047	0	0	0	0
	粘度指数向上剤		0	0	0	4.8	7.8	0	9.4
新油性状	動粘度@40℃	mm^2/s	59.9	59.2	58.7	51.5	46.5	59.4	46.8
	動粘度@100℃	mm^2/s	8.2	8.1	8.1	8.3	8.2	8.2	8.5
	粘度指数		106	104	105	134	151	106	160
	NOACK蒸発量	重量%	6.9	6.8	7.1	13	17	6.9	22
性能評価結果	潤滑油消費特性*								
	・潤滑油消費量	g/h	32	31	30	34	39	32	45
	潤滑油燃焼性**								
	・熱分解温度	℃	239	259	248	238	241	292	268

*エンジン:IDI、3.0L、過給機付き、 試験条件:3600回転、1/4負荷、油温110℃

**試験条件:80%He+20%O_2、昇温速度10℃/min、示差熱分析の発熱ピークを熱分解温度とした。

[0044]The lubricating oil composition which made specific lubricant base oil contain at least one sort of a specific combustion improver from the result of an above-mentioned example and comparative example, It became clear that lubricating oil flammability is excellent, i.e., PM in diesel-power-plant exhaust gas decreases as a result, without having an adverse effect on lubricous oiliness ability, for example, the lubricous oil consumption characteristic.

[0045]

[Effect of the Invention]The lubricating oil composition for diesel power plants of this invention, By containing at least one sort of combustion improvers of specific oil-soluble organic acid metal salt as an essential ingredient in specific lubricant base oil, the suspended particulate matter (PM) discharged can be reduced, and the prominent effect of excelling in the lubricous oil consumption characteristic is demonstrated.

[Translation done.]

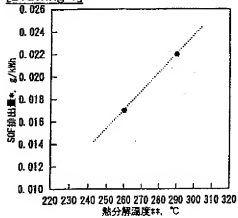
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]Drawing 1 is a figure showing the pyrolysis temperature by a differential-thermal-analysis method, and the relation of a SOF discharge.
[Drawing 2]Drawing 2 is a mimetic diagram showing an engine combustion chamber.
[Description of Notations]
1 Inhalation of air
2 Exhaust air
3 PM
4 Lubricating oil
5 Fuel
6 Piston
7 Inlet valve
8 Exhaust valve

[Translation done.]

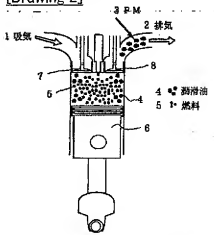
DRAWINGS

[Drawing 1]



*:エンジン：DI、4.0L、過給機付き、試験条件：2700回転、4/5負荷、油温100℃
**:80%*+20%O2、昇温速度10℃/min、示差熱分析の発熱ピークを熱分解温度とした。

[Drawing 2]



[Translation done.]